

## 4 WATER QUALITY STANDARDS AND OBJECTIVES

Book 1 of this document provides a description of the watershed conditions and describes the numerous investigations conducted to develop this Plan. This section uses the data and results of those studies, along with NJDEP regulations, to develop the Water Quality Standards and Objections. Book 1 provides details on the monitoring that was done, including sampling locations and results.

### 4.1 Water Quality Management Units

The water quality planning units are shown as Figure 7 and Table 14 are described as follows:








1. Upper Wreck Pond Brook (west of Route 18)
2. Lower Wreck Pond Brook (east of Route 18)
3. Hannabrand Brook
4. Black Creek
5. Wreck Pond Direct

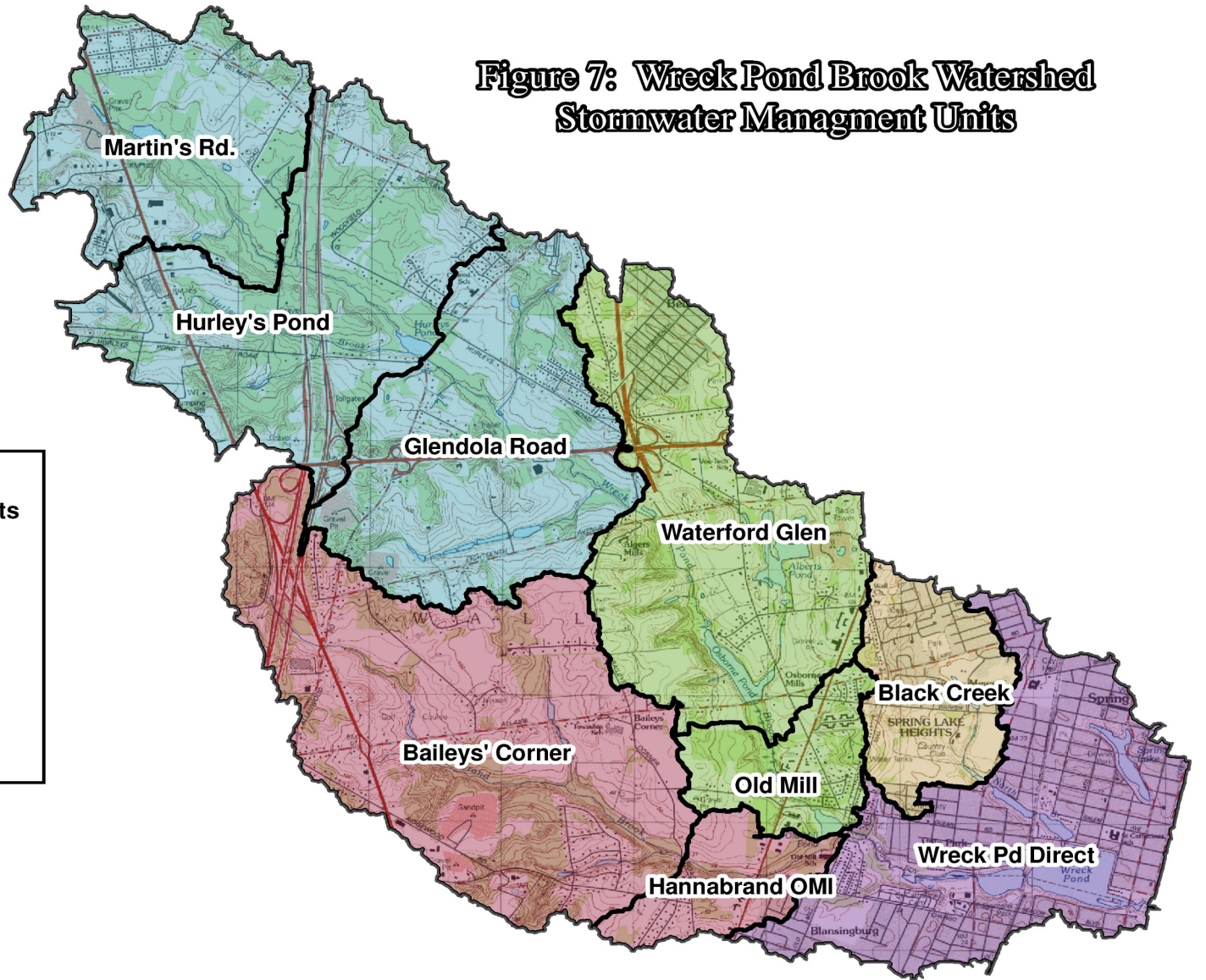
<b>Table 14: Watershed Management Units</b>		
<b>Unit</b>	<b>Subwatershed (Station) and County Station</b>	<b>Area (acres)</b>
<b>Upper Wreck Pond Brook</b>		<b>3106.4</b>
	Martin's Road (W6)	821.23
	Hurley's Pond Dam (W9)	1164
	Glendola Rd (W7)	1121.17
<b>Lower Wreck Pond Brook</b>		<b>1534.84</b>
	Waterford Glen (W1)	1231.78
	Old Mill Dam Culvert (W3)	303.06
<b>Hannabrand Brook</b>		<b>1976.46</b>
	Bailey's Corner Rd (W5)	1716.75
	Hannabrand Brook Culvert (W2)	259.71
<b>Black Creek</b>	Black Creek (W8)	<b>416.4</b>
<b>Wreck Pond Direct</b>	Wreck Pond Direct	<b>1137.96</b>

Upper Wreck Pond Brook includes the Martin's Road, Hurley's Pond and Glendola Road subbasins. The management unit occupies about 3,100 acres and includes some of the least developed areas within the watershed. The Lower Wreck Pond Brook unit

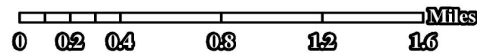
**Figure 7: Wreck Pond Brook Watershed  
Stormwater Management Units**

**Legend**  
**Stormwater Management Units**

-  Black Creek
-  Hannabrand Brk
-  Black Creek
-  Lower Wreck Pond Brk
-  Upper Wreck Pond Brk
-  Wreck Pond Direct
-  Sub-Watersheds



Names are Subwatershed Names  
Map Author: Najarian Associates  
03.26.2008



extends from Glendola Road to the Old Mill dam culvert and includes the Waterford Glen and Old Mill subwatershed areas and about 1535 acres. Most of the flows within the watershed are generated in these two management units.

The Hannabrand Brook unit includes the Bailey's Corner Road and Hannabrand Brook at Old Mill Road sub-watersheds. This unit has mixed land uses and some of the studies for this Plan identified areas in need of remediation. The Black Creek unit includes the Spring Lake Golf Course and the ponded section of that water which is the subject of concern to area residents. Finally, the Wreck Pond Direct unit includes Wreck Pond Brook downstream of Station W3 and Wreck Pond itself and is primarily developed. Flows enter the Pond through stormwater pipes in much of this unit.

## **4.2 Existing Stormwater Related Concerns**

The initial RSWMP Committee focused primarily on sediment and bacteria concerns related to possible dredging of Wreck Pond and the bathing beach closures. Development of the plan, including the studies and analyses conducted as part of the RSWMP and the valuable input of the RSWMP Committee members, have identified a number of concerns related to stormwater in the watershed. This section identifies those concerns, starting with water quality impairments identified by NJDEP.

### **4.2.1 Water Quality Impaired Uses**

Waters in NJ are classified and each classification includes designated uses in accordance with the Federal Clean Water Act and NJDEP regulations. As discussed in Section 2 in Book 1, the waters within the Wreck Pond Brook watershed are classified as FW2-NT and designated uses include maintenance of aquatic life and primary and secondary contact recreation. These uses are sometimes referred to as "fishable and swimmable". NJDEP has developed Surface Water Quality Standards (SWQS) designed to ensure that if the waters meet the applicable standards, the designated uses are attained. Current water quality standards (adopted October 2006) relevant to this Management Plan are listed in Table 15.

It should be noted that the previous water quality standards included fecal coliform instead of E. Coli limits for bacteria levels in freshwaters. Those standards were 200/100 ml with no more than 10 percent of samples in any 30-day period exceeding 400 per 100 ml. The water quality monitoring done for this RSWMP was done prior to the adoption of the current standards in October of 2006; thus fecal coliform was measured and the results are compared to the former standard.

Table 15: Relevant Surface Water Quality Standards		
Parameter	Standard	Classification
Bacteria: Primary Contact Recreation	Enterococci levels shall not exceed a geometric mean of 35/100 ml, or a single sample maximum of 104/100 ml.	SC Waters (Atlantic Ocean)
	E. Coli levels shall not exceed a geometric mean of 126/100 ml or a single sample maximum of 235/100 ml.	FW2 Waters
Dissolved Oxygen (DO)	24 hour average not less than 5.0, but not less than 4.0 at any time	FW2 Waters
Phosphorus	Phosphorus as total P shall not exceed 0.05 in any lake, pond or reservoir, or in a tributary at the point where it enters such bodies of water	FW2 Lakes
	Except as necessary to satisfy the more stringent Lake phosphorus as total P shall not exceed 0.1 in any stream	FW2 Streams
pH	6.5-8.5	FW2
Total Dissolved Solids (TDS)	i. No increase in background which may adversely affect the survival, growth or propagation of the aquatic biota and ii. No increase in background which would interfere with the designated or existing uses, or 500 mg/L, whichever is more stringent	FW2
Total Suspended Solids (TSS)	40 mg/l	FW2
Turbidity	Thirty-day Average of 15 ntu, allowed maximum of 50 ntu	FW2

The NJDEP has assessed most waterbodies in the state for attainment of designated uses as required by USEPA regulations. The NJDEP then lists each water on one or more sublists as to whether designated uses have been attained as determined by conformance with various water quality standards. The sublists are defined as follows:

**Sublist 1 – Full Attainment:** All designated uses are assessed AND all uses are attained.

**Sublist 2 – Attain:** The designated use is assessed and attained BUT one or more designated uses in the assessment unit are not attained and/or there is insufficient information to make a determination.

**Sublist 3 Insufficient Data:** Insufficient data is available to determine if the use is attained

**Sublist 4A Non-Attain:** The designated use is not attained or is threatened; however, development of a Total Maximum Daily Load (TMDL) is not required because a TMDL has been developed for the pollutant causing non-attainment.

**Sublist 4B - Non-Attain:** The designated use is not attained or is threatened; however, development of a TMDL is not required because other enforceable pollution control requirements are reasonably expected to result in conformance with the applicable water quality standard(s) in the near future and the designated use will be attained.

**Sublist 4C - Non-Attain:** The designated use is not attained or is threatened; however, development of a TMDL is not required because non-attainment is caused by something other than a pollutant (e.g. “pollution” such as overland flow of stormwater, stream flow alterations, and habitat degradation).

**Sublist 5 – Non-Attain:** The designated use is not attained or is threatened by a pollutant(s) and a TMDL is required.

NJDEP uses specific parameters to evaluate use attainment. For General Aquatic Life, NJDEP uses biological parameters and if these are not available pH, DO, temperature, total phosphorus, TDS and TSS. For Recreation, bacteria levels are used, including fecal coliform or E. Coli in freshwaters and Enterococci in saline waters. NJDEP updates these lists every other year and develops an Integrated Report on water quality in accordance with requirements of the Clean Water Act, specifically sections 303(d) and 305(b).

Both the upper and lower portions of Wreck Pond Brook are listed as impaired for pH on the NJDEP’s 2006 303(d) list. Both sections are on Sublist 5 as impaired for Aquatic Life (general) and the upper section is also impaired for Aquatic Life (trout). However, the trout listing appears to be an error as Wreck Pond Brook is a non-trout stream and, according to the Integrated Report, only trout waters are to be assessed for that use. Both segments are on list 4A for Primary Contact Recreation. For Secondary Contact Recreation the lower segment is on Sublist 2, while the upper is on Sublist 3. The NJDEP 305b report notes that coastal area streams near the Pinelands often have naturally low pH. However, as the standards is 6.5-8.5, streams that have pH levels that fall below that value are considered out of compliance. The County water quality data summarized in Book 1 shows that the upper watershed stations on Wreck Pond Brook have pH that is below standard. The mean pH at W6 and W9 are below 6.5 while at W7, it is just above the standard. Further downstream the pH levels conform to the Standard. At W3, the mean pH is 6.8, while the minimum is 6.01.

Hannabrand Brook was listed for fecal coliform as impaired for primary contract recreation on Sublist 5 with high priority and for pH for aquatic life with medium priority in 2004. A TMDL was developed for this stream in 2005. The TMDL report focused on

ways to reduce bacteria levels in stormwater. Hannabrand Brook is not listed in the 2006 listings, but is noted as de-listed for fecal coliform but not for pH. According to the Integrated Report, this Brook should appear on List 4A for fecal coliform and should be similar to WPB for pH. Monitoring conducted for this study shows that fecal coliform is elevated on the Hannabrand Brook. From mid-July through August (three bi-weekly samples in 2006), the geometric mean was 660 col/100 ml, which exceeds the standard.

Wreck Pond is listed on Sublist 3 for Recreation (primary contact) and on Sublist 5 for both Recreation (aesthetic) and aquatic life. The Integrated Report notes that the aesthetic notation is now determined to be the result of eutrophication and assumed to represent phosphorus impairment.

For aquatic life, the western part of the Pond (WP1) was below the 6.5 mg/l range in monitoring done for this Plan. DO dropped below 4 mg/l for one measurement during the summer of 2006 and in some of the data collected by Monmouth University. Both TDS and TSS were above standard, although the TDS may be related to salinity. The 75<sup>th</sup> percentile for TSS is 22.6 mg/l, which is below the standard. The lab turbidity met the standard, although the field turbidity did not. Total phosphorus exceeded the standard of 0.05 mg/l with the median value at 0.055 mg/l. TDS in the eastern part of the Pond was above the standard. However, this area is subject to tidal exchange so that the chloride levels are also higher which is related to the TDS.

The comments section for the Integrated Report notes that Wreck Pond is also on Sublist 4B for bacteria impairment of primary contact recreation. However, the Appendix List in the Integrated Report notes it as Sublist 3.

#### **4.2.2 Bathing Beach Closures**

Wreck Pond is the major presumed source of Ocean bathing beach closures in the Boroughs of Spring Lake and Sea Girt. Outflow from the Pond during certain storm events can bring a plume laden with bacteria to the bathing beaches. Monitoring of Wreck Pond for this Plan found fecal coliform bacteria at a geometric mean of 1,069 col/100ml at Station WP2 for the period from mid-July to late August and of 849 col/100 ml at Station WP3 for August. This is discussed further in Section 1 of Book 1.

#### **4.2.3 Ecologic Concerns related to Water Quality**

Phosphorus is above standard and is the range for a eutrophic pond. Chlorophyll-a is also high in the Pond, reaching over 20 ppm in the summer months. Algae are visible in numerous Ponds throughout the watershed. The DO in the western section of the Pond dropped below 4 mg/l in the summer.

Limited sampling on the ponded portion of Black Creek revealed super-saturated DO, elevated total P and low secchi depth. Chlorophyll-a was not measured here, but algal blooms are noted on Black Creek.

#### **4.2.4 Flooding Issues**

Flooding issues are of concern in certain parts of the watershed. Along Wreck Pond in Spring Lake and Spring Lake Heights, flooding from Pond overflow occurs due to fluvial flows combined with high tide conditions. Flooding also occurs routinely along 18<sup>th</sup> Avenue in the vicinity of the Wall Township recreation fields due to a lack of drainage structures (basins, inlets, piping etc) and reportedly overflows onto the road and neighboring properties. Other upstream areas flood as well. Extensive flooding was noted during the storm of October 2005.

#### **4.2.5 Habitat Loss**

Habitat loss is of concern as undeveloped lands such as woodlands, fields, and agricultural lands are converted to more intensive uses such as residential lands.

The environments of highest value in the watershed include the ponds, streams, stream corridors, wetlands and associated buffers that will be protected by existing NJDEP regulations under most development schemes. This will help avoid loss of the most valuable habitat. In cases where DEP regulations do not apply, habitat loss may occur with development in these environments.

#### **4.2.6 Stormwater Management Problem Ranking**

The stormwater management issues within the watershed are inter-related. A strict ranking of problems is difficult and will vary by interested party. For example, beach closings are of great importance to officials and residents in Spring Lake and Sea Girt, while other issues may be more important in the upper watershed.

The major stormwater management problems identified are:

- Ocean swimming beach closings in the vicinity of the Wreck Pond outfall, assumed to be due to excessive bacteria loadings from the Pond
- Ongoing eutrophication and water quality degradation of watershed ponds. Conditions in Wreck Pond and Black Creek are of particular concern including observed severe shallowing and reduced tidal action in Wreck Pond
- Flooding in the lower watershed. The causes of the flooding are the limited outflow from the Wreck Pond discharge pipe especially during high tide, stream channel blockages due to debris, loss of storage volume in some ponds due to sedimentation and the tidal nature of Wreck Pond.

The pollutants of major concern in the watershed and Wreck Pond include bacteria, phosphorus, sediment and nitrogen. The input of phosphorus and nitrogen to the

streams and ultimately the Ponds, leads to enrichment that promotes algal growth. The bacteria are the source of beach closings. Sediment is leading to the shoaling of the ponds within the watershed and diminished storage for flood flows as well as decreased flow attenuation that promotes settling of sediment and associated pollutants.

### **4.3 Specific Water Quality and Quantity Objectives**

Initially, the RWSMP focused on reducing sediment loads in support of NJDEP's plan to dredge the Pond. In addition, the plan focused on eliminating or greatly reducing Ocean bathing beach closures due to bacteria flows from the Wreck Pond outfall. As Plan development proceeded, additional objectives were identified as a result of detailed data collection and input from local citizens. Objectives were expanded to include measures to reduce flooding, improve wildlife habitat, control water fowl, improve overall water quality and aesthetics of local waters and enhance recreational opportunities.

Specific water quality objectives for this Watershed Management Plan are to reduce pollutant loading levels and remove accumulated pollutants to allow attainment of all designated uses that are not limited by natural conditions. In particular, the goals are:

- Reduce bacteria levels in Wreck Pond and tributary streams to meet standards and attain the designated uses
- Eliminate or greatly reduce beach closings due to outflow from Wreck Pond or other watershed sources
- Reduce sediment loads to Wreck Pond and other ponds from both existing sources and new development.
- Reduce phosphorus loads and concentrations to meet standards, reduce eutrophication of ponds, reduce algal blooms and attain the designated uses.
- Reduce nitrogen loads to reduce eutrophication and algal blooms
- Improve the water quality, ecological health and aesthetics of Wreck Pond, Black Creek, other Ponds and the overall watershed
- Determine natural background pH levels for tributary streams to set local standard

Water quantity objectives focus on the hydrodynamic systems of streams, ponds, groundwater flows and surface runoff from developed and natural areas. In particular, objectives include:

- Improve understanding of the relationships between stream hydraulics and surface/groundwater flows and their relationship to land use management



- Identify key areas within the watershed that have a beneficial or negative impact on stream flow dynamics or stream processes
- Develop management measures, design guidelines and standards which will improve, enhance or maintain (where appropriate) the hydrologic and hydraulic characteristics of the watershed.
- Analyze expected land use changes in the watershed to anticipate or predict potential future flow and flooding problems.

Many of the studies conducted for this Plan have provided valuable information to meet or partially meet these goals. The ongoing implementation process will provide greater detail and understanding of the issues and solutions within the watershed. The RSWMP has identified design and performance standards as discussed in Section 5, following. Specific mitigation projects are In addition, the Plan has mitigation projects, and an implementation strategy designed to meet these goals, that are described in the following sections. Further achievement of these goals will require additional effort within the watershed.

## 5 DESIGN AND PERFORMANCE STANDARDS

As part of the regional stormwater management plan development process, NJDEP Rules (Subchapter 3 of NJAC 7:8) require that watershed specific design and performance (D&P) standards be developed that will address the problems identified during the study portion of the project. D&P standards augment the general best management practices already required by NJDEP for new development. Watershed-specific D&P standards must address not only new development, but existing sources of pollutants and other problems identified within the watershed.

The Design and Performance Standards must be implemented by NJDEP and local municipalities. Thus, these standards will be further refined during the implementation phase of the RSWMP. This section discusses existing State, regional and local development controls, proposes additional management measures for new and identifies methods to reduce loadings from existing developed areas and other existing pollutant sources.

### 5.1 Management Measures for New Development

Reduction of future loadings within the watershed depends on control of stormwater from future development including construction. NJDEP and other state agencies control development of larger projects through various regulations. However, smaller projects or redevelopment and expansion of existing structures are controlled at the municipal level. The following sections discuss existing regulations and proposed measures to control loading from future land development.

#### 5.1.1 State Regulations

##### NJDEP

NJDEP has set several regulations that govern new development within the Wreck Pond watershed. These regulations will control the peak flow rate and volume of stormwater from new development. The following sections discuss these regulations.

**CAFRA:** The CAFRA Law governs develop within the Coastal Zone using the *Rules on Coastal Zone Management* (NJAC 7:7E). However, within the watershed the boundary is at Route 71. Thus, this regulation governs development generally in Spring Lake, Sea Grit and Spring Lake Heights, which are primarily developed. There is also a small area in the southwestern part of the watershed, between Route 34 and the Parkway subject to CAFRA. For locations more than 150 feet from the mean high water line of a tidal waterbody, only development of 24 units or more are regulated. Thus, this Regulation will have minimal impact on future development.

**Freshwater Wetlands Protection Act and Regulations (NJAC 7:7A):** The wetlands law governs development within wetlands or associated buffers. Only limited development is allowed in these areas under the regulations. Wetlands are shown on Figure 3, however, actual field delineation would be required prior to any development activity. As noted in Section 2, Build-Out Analysis, future development is not anticipated within the wetlands.

**Stormwater Management Rules (NJAC 7:8):** The stormwater management rules apply to any development that disturbs one acre or more of land or adds 0.25 acres of impervious surface. The rules govern stormwater generated by new projects. They emphasize the use of non-structural stormwater management techniques including minimizing disturbance and impervious surfaces and preserving natural drainage features. The rules also set requirements for maintenance of groundwater recharge and control of stormwater runoff quantity and quality. These regulations set Special Water Resource Protection Areas adjacent to Category One (C1) waters; however this does not apply in the watershed as no waters are C1.

The stormwater management rules require new development to maintain existing levels of groundwater recharge. In addition, the rules require control for stormwater peak flow, such that the post-construction peak runoff rates for the two, 10 and 100-year storm events are 50, 75 and 80 percent, respectively, of the pre-construction peak runoff rates.

These rules also require removal of 80% of the TSS generated from a site under post-development conditions. This is usually managed by a site using structural stormwater techniques, such as stormwater detention basins.

In addition, nonstructural stormwater management techniques must be incorporated into design of new developments. These techniques promote recharge and reduce direct runoff. The Rules seek to have new development conform to the following requirements:

1. Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss.
2. Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces.
3. Maximize the protection of natural drainage features and vegetation.
4. Minimize the decrease in the pre-construction "time of concentration."
5. Minimize land disturbance including clearing and grading.
6. Minimize soil compaction.
7. Provide low maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers, and pesticides.
8. Provide vegetated open-channel conveyance systems discharge into and through stable vegetated areas.
9. Provide preventative source controls.

The Rules require new development to include a certain level of nonstructural measures. These may include preservation of natural areas by deed restriction, use of native ground covers in place of turf grass, providing vegetative filters and minimizing land disturbance in project design. Management measures for impervious areas include using pervious paving as appropriate in driveways or parking areas, directing flow from impervious surfaces to sheet flow over pervious areas, dispersing or infiltration of roof runoff or changes to time of concentration.

**Flood Hazard Area Rules (NJAC 7:13):** These rules control development in flood hazard areas and limits fill of flood plains. The rules also require new development not to impact flooding on adjacent properties. The recent revised regulations require a riparian buffer around all streams, ranging in with from 50 feet to 300 feet. For this watershed, the riparian buffer will generally be 50 feet as the streams are not classified as C1. In these buffer areas, no vegetation can be removed.

**Maintenance:** The stormwater control measures required by NJDEP require regular maintenance to function properly. NJDEP requires maintenance plans to be submitted in permit applications.

### **NJDA - Soil Erosion and Sediment Control Program**

The Soil Erosion and Sediment Control Act of New Jersey, N.J.S.A. 4:29-34 et. seq., requires that land disturbances of 5,000 square feet or greater which require the issuance of a construction permit, submit a plan to the local soil conservation district for review and certification of temporary and permanent controls for soil erosion resulting from new development. These controls are to be designed in accordance with the *Standards for Soil Erosion and Sediment Control in New Jersey*, 6<sup>th</sup> edition (current). The Standards include design criteria for temporary and permanent controls such as waterway conveyances, slope protection, detention basin design, rock riprap outlet protection and the use of vegetation to permanently stabilize disturbed soils. The Standards also require that the designer demonstrate that the proposed stormwater management system will not cause erosion at the point of discharge nor downstream or “off site” – beyond the immediate limits of the development project. Hydrologic and hydraulic evaluations of land slope, vegetation, soil type and downstream channel hydraulics are to be evaluated under these Standards.

#### **5.1.2 Municipal Stormwater Management Plans and Local Ordinances**

Stormwater runoff generated by large-scale, new development is well controlled by NJDEP regulations. However, small projects or redevelopment may not be subject to NJDEP regulation. Local ordinances require stormwater control as well.

Each municipality is required to adopt a Municipal Stormwater Management Plan in accordance with NJAC 7:8. The four municipalities within the watershed have adopted stormwater management plans and have adopted or are in the process of developing Stormwater Control Ordinances. As discussed further in Section 5.2, the municipalities

have also adopted various ordinances to control certain non-point sources of pollution from existing development.

The municipalities should ensure that any development that does not require NJDEP review for stormwater incorporates stormwater BMPs to the maximum extent practicable. The following innovative measures should be considered by the municipalities as requirements for new development, redevelopment or home expansion projects, as feasible. In addition, homeowners should be encouraged to implement these measures, as appropriate, at existing homes.

**Rain Gardens:** Rain gardens are a way to increase infiltration and thus reduce direct stormwater runoff (see section 6.1.5). These are usable on individual lots and are gardens that include plants and soil conditions to enhance recharge. The County is working to develop a program to provide incentives to homeowners to plant these gardens.

**Dry Wells:** Roof runoff may be directed to dry wells for infiltration to the ground, rather than becoming direct stormwater runoff.

**Pervious Paving:** The use of porous paving or grass pavers may be appropriate for some types of development. This can enhance infiltration by reducing the amount of impervious area. Again, maintenance measures may be required to ensure proper continuing function of this type of pavement.

Stormwater management BMPs will only function properly if continually maintained. The municipalities should ensure necessary maintenance activities are conducted at all public and private stormwater facilities.

Municipalities will review and implement additional measures during the implementation phase of the Management Plan.

## **5.2 Management Measures for Existing Development**

Much of the watershed is already developed. Thus, control of new development as discussed above will only provide some reduction in pollutant loadings and stormwater flows. In order to meet the overall Plan objectives, measures are needed to reduce loadings from existing land uses or other existing sources of pollution. These measures require implementation by the individual municipalities or the County. The implementation of these measures will be further considered during the implementation phase, including feasibility and cost issues.

Each of the four municipalities has adopted a Stormwater Management Plan and has adopted or is in the process of adopting the ordinances required by the State for municipal stormwater management. The municipalities also are required to implement

a number of management plans and programs to manage stormwater and to ensure maintenance. These ordinances and programs include:

- **Pet Waste Ordinance:** Adopt and enforce an ordinance requiring owners and keepers to immediately and properly dispose of their pet's solid waste. Distribute informational brochure with pet licenses.
- **Litter Ordinance:** Adopt and enforce a litter ordinance, or enforce the existing State litter statute (N.J.S.A. 13:1E-99.3).
- **Improper Waste Disposal Ordinance:** Adopt and enforce an ordinance prohibiting spilling, dumping or disposal of any materials into storm sewers.
- **Wildlife Feeding Ordinance:** Adopt and enforce an ordinance that prohibits feeding of non-confined wildlife in any public park or property owned/operated by the municipality with some exceptions
- **Yard Waste Ordinance:** Adopt and enforce an ordinance that prohibits placing non-containerized yard waste in the street, with some exceptions or develop a yard waste collection program.
- **Illicit Connection Ordinance:** Develop, implement and enforce an ordinance, to the extent allowable under State law, to prohibit illicit connections to storm sewers.
- **Illicit Connection Elimination Program:** Develop, implement and enforce a program to detect and eliminate illicit connections into the municipality's small storm sewers.
- **Outfall Pipe Stream Scouring Remediation:** Develop and implement a stormwater outfall pipe scouring detection, remediation and maintenance program to identify and stabilize localized stream and stream bank scouring in the vicinity of outfall pipes operated by the municipality. Repairs shall be in accordance with the Standards for Soil Erosion and Sediment Control in New Jersey (N.J.A.C. 2:90-1).
- **Street Sweeping Program:** Municipalities are required to sweep certain streets and to report on the amount of material collected in these programs
- **Storm Drain Labeling:** Label storm drains as to "No Dumping" and provide means to maintain the labels.
- **Storm Facility Maintenance Program:** Ensure adequate long-term operation and maintenance of BMPs
- **Public Works Facility Requirements:** Ensure proper storage of material such as deicing substances or sand, proper vehicle fueling procedures, proper vehicle washwater management, proper vehicle maintenance, good housekeeping procedures and proper employee education.

The four municipalities are reported to be in compliance with these requirements by NJDEP for most items or are in the process of finalizing adoption. The municipalities provide data to NJDEP for compliance progress and implementation of the various programs.

The municipalities should continue to evaluate the effectiveness of the ordinances and programs and revise to improve their effectiveness, as permitted under NJDEP regulations and are expected to do so during the implementation phase.

### **5.2.1 Sanitary Sewer Improvements**

The developed portions of the watershed are sewerage. However, portions of the sewer system are up to 100 years old. The municipalities have spent time and effort investigating the condition of existing sewer main and trunk lines and improving them as possible. There is no evidence that this is a major source of bacteria to the Pond. Given the age of the sewer lines, however, there is the potential for seepage of sewage into the groundwater and then into the Pond. Data from NJDEP and Monmouth University studies identify this as a potential source of bacteria to Wreck Pond.

Municipalities have adopted Illicit Connection Elimination Programs which require continued investigation of their sewer infrastructure. Identified problems should be repaired as feasible. In response to the recent NJDEP studies, the municipalities and the County Health Department have looked further into the potential for leaking sewer infrastructure. As of this date, no major sewer leaks were found.

In addition, as in any developed area, leaks at individual homes may occur. Education of the public as to the importance of controlling such leaks should be implemented.

The municipalities have adopted Illicit Connection Ordinances that would not allow any such connections. Further review is expected during the implementation phase.

### **5.2.2 Pet Waste Reduction**

The Municipalities have adopted Pet Waster Ordinances and provide information along with pet license materials. Municipalities should continue efforts to ensure pet owners clean up after their pets. Pet owners are generally compliant about cleaning up after pets on roads and sidewalks and residential properties, but may not be as compliant in open space areas. This is particularly important in open space areas that border Wreck Pond, and other ponds or streams in the watershed.

### **5.2.3 Street Sweeping, Yard Waste and Storm Drain Maintenance**

The municipalities should continue street sweeping, yard waste management and drain maintenance as required by ordinance and programs. Street sweeping can remove sediment and associated bacteria and other pollutants from the streets. Sediments tracked onto paved surfaces during building or landscape renovations should be swept at the end of each day by the contractor.

Sediment and pollutants can become trapped in catch basins or storm drains. For example, during the outfall pipe sampling it was noted that at least one storm drain had a significant amount of sediment in it which impacted flow. Regular maintenance of

these systems will improve the function and reduce loading. The municipalities report on maintenance activities to NJDEP as part of their requirements under their municipal stormwater management plan and are expected to continue maintenance activities.

#### **5.2.4 Improper Disposal of Materials in Storm Sewers**

Improper disposal of waste material (used oil, paint cleaners or solvents) or other substances to storm sewers may cause pollution. Residents are not always aware that disposing of such substances through the storm drain can flow directly to a local water body. In addition, connection of non-stormwater flows directly or through sump pumps to the stormwater system may add pollutants. Municipalities are required to label storm drains and should consider addition action and education of residents, if non-compliance is identified as a concern.

#### **5.2.5 Waterfowl Management**

Wreck Pond is home to a variety of water flow including non-migrant Canada geese and mute swans. The other ponds within the watershed are also used by water fowl, particularly Hurley's Pond. The large number of waterfowl in the ponds are generating bacteria through fecal matter deposited directly into the water and on the shoreline. Thus, to fully control the bacteria levels in Wreck Pond, control of waterfowl is essential. Reduction in the water fowl use of Wreck Pond and other Ponds in the watershed will improve water quality and have positive aesthetic impacts.

However, water fowl control is a difficult problem facing many municipalities and water bodies, such as the Chesapeake Bay. The Atlantic Flyway Task Force has identified the reduction of the mute swan population as a priority for the entire Atlantic Flyway. In their 2003 Mute Swan Management Plan, New Jersey was noted to have about 1600 mute swans, while the task force suggested reduction of the state swan population to about 500 individuals. Mute swans are known to cause ecological damage including damage to aquatic vegetation and generation of bacteria. However, swans also keep the resident goose population down due to competition.

The location of Wreck Pond in a suburban area means that methods to control the waterfowl may be controversial. The municipalities have adopted Waterfowl Feeding Ordinances which may discourage water fowl from remaining in the area. Other possible measures are discussed as follows.

**Egg Addling:** One of the least controversial methods of control is egg addling. The eggs within the nests are oiled and left in the nest. This prevents the eggs from hatching, yet because there are eggs in the nest, no further eggs are laid. The disadvantages are cost, man-power and the fact that most of the eggs in the population must be addled in order for this technique to have an impact on the overall population size.



**Adult Population Management:** Direct reduction in adult populations would involve relocating or euthanizing the waterfowl. Relocating may be difficult, as many areas within coastal New Jersey contain an overabundance of waterfowl. Local opposition may be expected to any plans to eliminate or euthanize waterfowl.

**Repellents:** Various substances are placed on shorelines to discourage water fowl use on shorelines. These repellents have varying degrees of success. Issues that have been associated with these are removal of the repellent by fast wash-off during rain events or by mowing.

**Habitat Modification:** Shoreline habitat can be modified to discourage geese from using these areas. This would require modifying the current grass areas using plantings. These plantings could also be used to hide low fencing that may discourage waterfowl. Local residents may be concerned about re-landscaping grassed areas to other vegetation.

The communities within the watershed should work together and with other local communities to manage geese on a regional basis. Local and county officials should continue to investigate new options to manage water fowl. Local citizens and officials must become informed about the consequences of permitting the continued growth of waterfowl populations in order to develop local support for a comprehensive management program. The implementation phase will include analysis of further measures.

### **5.2.6 Agricultural Practices**

There is a relatively small percentage of agricultural land in the watershed and on-farm inspections and surveys suggested these lands have minor to no impacts on the region (see Book 1, Section 5). The relatively larger equine farms, those with approximately more than 5 horses, appeared to be well maintained in terms of manure management. The smaller farms were also well maintained, but there one simple measure that can further minimize impacts to the watershed is the installation of concrete-enclosed manure compost piles to prevent runoff flowing through these piles and entering streams.

Those farms with field crops or vegetable production also had well maintained facilities. Further reduction in possible impacts can be obtained by reducing nutrient application to that which is needed for the specific soil condition. In addition to nutrient management techniques, Rutgers Cooperative Extension offers soil nutrient testing services for a small fee. RCE will analyze soil samples for basic nutrient levels and advise of proper fertilizer application rates to achieve optimum crop production. Soil sample testing not only helps protect water quality but also provides an economic benefit as well.

Another simple practice is the planting of narrow (10 to 20 feet) wide grass filter strips around field edges to help trap sediments which would otherwise be conveyed off site during periods of moderate to heavy rainfall.

### **5.2.7 Improvement of Existing Stormwater Facilities**

In highly developed areas, like the eastern part of the watershed, the opportunity to place stormwater management facilities at new development is limited as there is little new development. Existing stormwater controls may be limited in these developed areas. However, there may be opportunities to modify existing stormwater inlets or other structures to enhance stormwater quality control. Measures including infiltration systems, permeable paving, and bio-retention systems can be introduced at sites where the soil permeability and depth to the seasonal high water table are suitable. Areas for such new measures include parking lot islands, vacant land, and roadside swales. Rain gardens are areas with special landscaping to which runoff from roofs and impervious surfaces are directed. Monmouth County is planning a pilot study of these features (see Section 6.1.5).

The local and County stormwater facilities generally are subject to routine maintenance activities in accordance with the Municipal Stormwater Management Plans. In addition to careful consideration of existing conditions and localized flooding problems, the responsible agencies should be required to look for opportunities to enhance stormwater quality in any storm sewer system repairs or updates. Design of replacement inlets or culverts to provide water quality function should be considered during the implementation phase. Section 6 discusses an initial project currently being implemented by Monmouth County with funding from NJDEP. .

### **5.2.8 Fertilizer Application for Residential Landowners**

As indicated in Section 5.2.6 above, appropriate application of fertilizers and pesticides to vegetation is environmentally and economically beneficial. Residents should be encouraged to reduce application of lawn products to that needed by the soil. Soil testing services offered by RCE are not limited to the agricultural community but are available to anyone interested in learning more about soil quality and health. In addition to testing services, Rutgers makes many articles available to landowners on various subjects such as pest control, disease identification and treatment, horticulture, turf management etc. Residents of the watershed should be made aware of this testing during implementation of the Plan.

NJDEP's Clean Lawns initiative has partnered with fertilizer manufacturers to reduce the level of phosphorus within fertilizers to that typically needed in lawns. The use of these fertilizers is expected to reduce phosphorus loading levels.

## **6 RECOMMENDED STORMWATER MANAGEMENT SPECIFIC PROJECTS**

In addition to the general management measures noted in Section 4, above, reductions in stormwater loadings may be gained by improvements to specific sites, by restoration of waters or streams in the watershed, by construction of new stormwater management facilities and by retro-fit of existing stormwater management facilities.

Through field study, consultation with the local municipalities and stakeholders in the watershed, and data review, the WPB TAC identified areas within the watershed that were of concern for pollution generation. In response to these concerns, the WPB TAC developed the *Early BMP Recommendations* list in 2005 that focused on controlling water quantity and improving water quality at discharges from specific sites. These projects are also designed to improve ecological conditions throughout the watershed. The list was developed through extensive field reconnaissance and site visits by the early members of the TAC, specifically, representatives from the County, NJDEP, MCOOGIS and NJDA. This *Early BMP Recommendations* list was submitted to the NJDEP in May 2005 in order to secure available NJDEP restoration funds for specific projects. An initial cost estimate was developed at that time which was revised to reflect current cost estimates as shown in Table 16.

Since the Initial BMP list was developed, funding has been provided by NJDEP for initiation and implementation of several projects. The allocated funding is shown in Table 16. Section 6.1, following, details the funded projects and 6.2 details Priority Projects that are proposed for future funding.

In addition to the *Early BMP Recommendations* list developed in May 2005, the Committee has since added projects to the final list of specific projects. These projects were added following additional reconnaissance, modeling results, public input, etc. These are identified in Section 6.3.

The prioritization of these recommendations was based on need for the project, time to implementation, potential impact, short- and long-term benefits, cost, maintenance requirements, habitat disturbance and improvement, and scale.

### **6.1 Funded Projects**

NJDEP has recognized the importance of the improvement projects identified in the early stages of planning and has allocated funds for several best management practices which have been identified by the TAC and others. These projects are listed in Table 17 and described in detail in the following sections.

<b>Table 16: Early Recommended BMP Cost Estimates</b>				
<b>BMP</b>	<b>Details</b>	<b>Estimated Total Cost (\$) (2005)</b>	<b>Estimated Total Cost (\$) (2008)</b>	<b>Funding Allocated (\$)</b>
Installation of Stormwater Treatment Devices	15 - 25 devices	1,290,000	1,406,100	1,200,000
Restoration of Old Gravel Pit on Ridgewood Road, Wall	Detention/WQ basin	391,000	426,190	500,000
Restoration of Spring Lake Golf Course Weir	Restoration of pond and weir	1,156,000	1,260,040	200,000
Wreck Pond Brook Headwaters Restoration	Restoration of berms, flow control, forebay, weir replacement, SWTD units	2,580,000	2,812,200	250,000?
Black Creek On-Line Sediment Basin	Installation of basin	190,500	Project removed, replaced by weir replacements at SLGC	
Create Natural Wetland at "Jimmy Burne" Site	WQ basin construction	620,000	675,800	0
Wreck Pond Shoreline Habitat Improvements	Shoreline stabilization and buffer plantings	900,000	981,000	0
Pond Dredging	Dredging of Old Mill and Hurley's pond, shoreline stabilization and buffer plantings	5,325,000	5,804,250	0
Upper Wreck Pond Restoration		675,000	735,750	0
<i>Initial Cost Estimates by Omni Environmental for 2005, updated costs from TAC Analyses for 2008</i>				

### **6.1.1 Installation of Manufactured Stormwater Treatment Devices**

Manufactured treatment devices are concrete structures that are added to a storm sewer system prior to outfall to a waterbody. The devices provide removal of sediments and associated pollutants from stormwater which can be removed later by maintenance crews. Fifteen to 25 structures (final number to be determined by actual construction costs) will be installed on storm sewer systems discharging to Wreck Pond, Black Creek or Spring Lake. Funding provided includes an initial grant of \$30,000 for preliminary study and \$1,200,000 for Final Design and Construction (NJDEP).

<b>Table 17: Funded Projects List</b>				
<b>Project Name</b>	<b>Location</b>	<b>Concerns Addressed</b>	<b>Funding Amount (\$)</b>	<b>Current Status</b>
Installation of Stormwater Treatment Devices	Vicinity of Wreck Pond	Sediments and associated pollutants, Floatables	1,200,000	County selected consultant, project will commence in Spring 2008
Restoration of Old Gravel Pit, Ridgewood Rd, Wall	Headwaters of Hannabrand Brook	Flows, sediment/erosion, nutrients, bacteria	500,000	Operator lease will not be renewed, Wall will commence then with restoration
Restoration of Golf Course Weir	West of Route 71 at SL Golf Course	Flood Control, Sediment	200,000	Design Finalized, Work to commence ...
Wreck Pond Brook Headwaters Restoration	Adjacent to Route 34	Flow, Sedimentation & Erosion		
Rain Gardens	Various Locations in Watershed	Flow and General Water Quality	\$24,000	Site selection in process
Total Allocated Funds			\$1,924,000	

In August 2006, a preliminary engineering analysis for the installation of such devices was initiated. The preliminary analysis included prioritization of unit placement, preliminary flow analysis, unit sizing, solicitation of unit pricing and specifications, and preparation of cost estimates. The funds are expected to allow retrofit of 15 to 25 stormwater outfalls. Studies done as part of this Plan determined the drainage area of various outfalls. A separate study for the County then looked at the existing infrastructure at each of the outfalls under consideration. In order to reduce cost, the installations were targeted for roadways or other publicly owned lands to eliminate the need for easements on private lands or land acquisition. The next step was investigation of the existing infrastructure for each potential outfall as to the difficulty of conducting the retrofit. Using these criteria, 25 outfalls were identified as possible sites for retrofits. Of these, ten are located within Spring Lake, nine in Spring Lake Heights, two in Wall and four in Sea Girt.

In March 2008, the County initiated a contract for final design and construction administration for the installation of the devices. Work to be performed under this contract includes surveying all potential unit sites, development of site plans, final

design of units, preparation of construction drawings and specifications, aiding the County in the public bidding process to determine a contractor, construction administration and construction inspection. This work has been initiated and preliminary design has been developed for a number of these retrofits.

Detailed engineering will be conducted for each retrofit. Thus, it is possible that it will not be feasible or cost effective to install all of these devices. Water quality sampling is proposed following installation of the devices to determine their actual field effectiveness.

### **6.1.2 Restoration of the Ridgewood Road Former Gravel Pit**

The site is located in the headwaters of Hannabrand Brook off Ridgewood Road in Wall Township. This site was formerly a Gravel Pit that is now owned by Wall Township and is currently used for shredding trees and stumps from land clearing operations, along with additional processing of landscaping material. The material is stockpiled and wholesaled as landscape mulch material. There are two stormwater discharge points that can be modified in order to attenuate stormwater flow, arrest sediment transport and deposition and address potential transport of contaminants from the site to the Hannabrand Brook. The old mining pit is approximately 100 or so acres in area.

A number of field visits to the site took place during the Plan development period. Site visits in 2005 and 2006 by TAC members provided information on basic site conditions and the stormwater runoff discharge points. The dimensions of the discharge channels leading from the site through the stream buffer were indicative of large flow volumes coming off the site during storm events.

Additionally, a recent January 2008 site visit by TAC members following a moderate rainfall event provided information regarding stormwater runoff quality. The southeastern discharge channel leading to the Hannabrand Brook contained moderate flow depths and discolored water. This flow path was followed by Committee members to the discharge point into the Hannabrand Brook, where a visible plume was entering the Brook. This fine suspended material clearly was coming from the site and its operations.

The site is mostly cleared and stockpiles of processed material may be the source of nutrients, bacteria and sediment. In addition, color and possibly contaminants in the water may be associated with a mulch dyeing process. Once in the channel, the dark gray color of the water persisted as it flowed towards the Brook. Thus, during the flows observed, it appears that the fine material does not settle out before discharge to the Brook.

It should also be noted that during Rutgers University's assessment work, macroinvertebrate sampling was performed at all eight County sampling sites. The results indicate that biodiversity was lowest at the site located just downstream of the gravel pit.

Since the drafting of the Recommended Projects List, Wall Township submitted a Green Acres application and now owns the property. Wall Township is presently leasing the land to the current operator, and material processing will continue until the lease expires. Once the lease is expired and all restoration issues are addressed, Wall Township has plans to convert the property into passive recreation.

NJDEP has provided \$500,000 for restoration of this site. Wall Township plans to undertake restoration once the lease is up for the current operator. In the meantime, Wall Township will work with the lease operator to reduce the discharge of contaminants to Hannabrand brook with temporary measures.

Restoration efforts may include drainage modifications to eliminate uncontrolled runoff to Hannabrand Brook, removal of debris and regarding and restabilization of poor, barren slopes. The use of clean dredge materials from watershed lake dredging projects as soil amendments should be considered as an aid to improving growing conditions at the former sand and gravel mine site.

### **6.1.3 Restoration of Weir at Spring Lake Golf Course**

The weir structure at the outlet of the golf course pond system is responsible for controlling all the runoff from the entire Black Creek (W8) subwatershed area. The pond functions as a sediment and nutrient trap. The weir is in bad repair with numerous leaks and rotting timbers and is in danger of failure. Findings from reconnaissance and modeling efforts support the fact that this dam is vital to the preserving the ecological and flow conditions of Black Creek downstream of Route 71, as well as Wreck Pond. The dam provides significant settling potential for sediments in stream flows originating upstream of Route 71, and detains large volumes of stormwater runoff during storm events. The pond system mitigates the effects of localized flooding by backing floodwaters up into the golf course itself. Without the pond system, runoff from this drainage area would only increase flooding in the surrounding areas along Black Creek and Wreck Pond during large storm events.

In the early stages of plan development, a sediment basin was proposed to be constructed just downstream of the Rt. 71 culvert, to catch and settle particulates and sediments prior to entering the main body of Black Creek. It would require that a portion of the upper reach of Black Creek be utilized as a settlement area for this purpose. It became evident that a project of this scope would be extremely expensive and difficult to construct, and it was uncertain if permits could be obtained to do the work. The golf course had previously done significant engineering work and had already obtained permits for substantial renovation to the course's water features.

In cooperation with the TAC, it was decided that the golf course pond already provided the control that would be obtained from the sediment basin proposal. As a result, NJDEP provided funding for the weir and bulkhead to be reinforced with plastic sheet pile installed along the upstream face of the timber weir and bulkhead. Existing flow

characteristics will be maintained. As a side benefit, the sheet piling will be installed deep enough to prevent seepage coming under the weir as it presently does, further controlling base flow and preserving the integrity of the structure. Additionally, the golf course will perform maintenance of the weir and pond (periodic dredging) at their cost which is a significant benefit ecologically as well as economically to the downstream communities.

NJDEP has provided \$200,000 for design and implementation of a new weir. The design is completed and implementation is anticipated. Implementation costs were estimated to be about \$900,000.

#### **6.1.4 Wreck Pond Brook Headwaters Restoration**

This project would provide restoration and add additional stormwater management measures for an area at the headwaters of Wreck Pond Brook. This area receives stormwater from existing commercial development and barren land opposite the New Jersey Sand and Gravel operation located on State Highway Route 34 in Wall Township. The area receives stormwater flow from about 25 acres of impervious surface (all commercial/industrial) and another 100 acres or so of barren land.

An abandoned sand wash water pond, known as Kellers Pond, is located several hundred yards downstream of Rt. 34 and receives runoff from the headwaters area as well as Rt. 34. The outlet weir or dam is "blown out" and no longer provides any significant stormwater control. Further, the pond is fairly shallow and receives significant deposits of silts and other sediments which wash off Rt. 34, drain from the NJ Sand and Gravel yards or is scoured from the man-made channel leading from the Rt. 34 storm sewer system to the Pond. The area surrounding and including the pond is owned by Wall Township which intends to manage the land for passive recreation and wildlife habitat.

The project scope is expected to include restoration of existing berms, design and construction of at least two spillways with sediment control forebays, design and construction of a new dam and weir to replace the existing system. Manufactured stormwater treatment devices (sediment removal only) also may be proposed in the stormwater system that serves the commercial complexes. An office complex is planned for a 10-acre property immediately adjacent to the proposed BMP area that will generate additional stormwater volume that may potentially discharge directly to the area. However, this project would be expected to be required to conform to NJDEP requirements for stormwater management.

The area contains a rich wildlife and wetland plant ecosystem that must be considered in design and construction of the project. The design is expected to include a new dam and weir to create a pond of perhaps 6 or so acres in size.

Since drafting of the original BMP list, the Committee solicited recommendations and quotes from the US Fish and Wildlife Service. Plans to reconstruct the outlet berm,



install sediment traps along Route 34 and restore the pond to improve habitat were discussed with a US Fish and Wildlife Service representative during a number of Committee meetings.

NJDEP has provided \$250,000 for further study of this option. Implementation costs are estimated at about \$300,000.

### **6.1.5 Rain Garden Demonstration Project**

Rain gardens are a recently developed best management practice which provides for the treatment and infiltration of runoff on individual properties. Roof and impervious surface runoff is directed to carefully constructed shallow depressions where the runoff is filtered and returned to ground water. Rain gardens are landscaping features and are designed with attractive, water-tolerant vegetation. They can be embellished with hardscaping materials such as stone and pavers to further enhance their aesthetic appeal while providing valuable control of small, nuisance-level, storm events. Compared to a conventional lawn, rain gardens allow 30% more water to soak into the ground. Because rain gardens are landscaped, they add beauty to a lawn and create a habitat for birds, butterflies and beneficial insects. According to estimates by Rutgers Cooperative Extension (RCE), one rain garden may recharge up to about 25,000 gallons of rainfall per year and thus reduces the amount of surface runoff and associated contaminants discharged directly to surface waters

The demonstration project provides funds to select and develop rain garden demonstration sites. The initial sites are expected to be public properties such as municipal complexes or schools. RCE will with local and regional agencies to select locations and the Master Gardeners of Monmouth County will help select appropriate plants with an emphasis on native species suitable for the particular soils. Educational materials will be included at each demonstration site. These projects will not only control runoff on these properties but will serve as locations for public outreach and education in order to encourage local residents to create their own rain gardens.

NJDEP has provided \$24,000 for site selection, design and construction of 4 demonstration Rain Garden projects.

## **6.2 Other Priority Projects**

In addition to the projects that have been at least partially funded, the TAC or other agencies identified several other projects for priority implementation. Table 18 identifies these projects and provides estimated costs, if known. Further detail is provided in the following paragraphs.

### **6.2.1 Dredging of Various Ponds**

Water quality data and modeling efforts within the watershed demonstrate the importance of many of the ponds in regulating flows and allowing settling of sediment and associated water pollutants. Some ponds are known to contain significant quantities of sediment and are in need of dredging. Shoreline improvements and modifications, including the use of wetland plantings, would be introduced where needed in order to maintain/improve habitat, reduce goose populations and improve water quality features. The following projects were recommended by the Committee.

- i) Dredge and restore Old Mill Pond in Wall Township to improve habitat and provide better stormwater management functions. Removal of sediments and outlet modification will be needed to increase stormwater flood control and enable future maintenance
- ii) Dredge and restore the impounded portion of Black Creek (aka North Branch of Wreck Pond) in its entirety between Route 71 and Ocean Road in Spring Lake and in the segment just west of the Route 71 Bridge.
- iii) Dredge and restore the western-most part of Wreck Pond on Wreck Pond Brook west of the Route 71 Bridge so it functions as a sediment containment and water quality management basin. This project would require construction of a weir at Route 71 and perhaps reconstruction of the pond so it would serve as a sediment trap and water quality feature. The pond should provide some habitat and recreation value when completed.
- iv) Dredge and restoration of Hurley's Pond, at Hurley's Pond Road. The pond is privately owned. It would require dredging from an existing average depth of about 2.5 feet to possibly 6 feet. The outlet weir under the road may also require modification.

<b>Table 18: Additional Priority and Other Future Projects List</b>			
<b>Project Name</b>	<b>Location</b>	<b>Concerns Addressed</b>	<b>Estimated Cost (\$)</b>
<b>FUTURE PRIORITY PROJECTS</b>			
Pond Dredging	Watershed Ponds- Old Mill, Hurley	Pond Ecology, Increase Pond storage volume, reduce sediment load, improve retention	\$5.8 mill
Stream Restoration – Hannabrand Brk & Wreck Pond Brk	Headwaters of streams	Stream flow, erosion, sediment, associated pollutants	\$2.8 mill for WPB only
Black Crk online Sedimentation Basin	Black Crk (No. Branch WPB)	Project removed from list, replaced by improvements to SLGC weir to serve same purpose	
Create Natural Wetland at “Jimmy Burne” Site	Directly west of Rte 71 and Wreck Pond Culvert	Sediment, bacteria, nutrients	\$675,800
Wreck Pond Shoreline Habitat Improvements	Wreck Pond	Bacteria, waterfowl populations	\$980,000
<b>OTHER POTENTIAL PROJECTS</b>			
Remedial/Restoration Projects at Public Works Yards	Spring Lake and Spring Lake Heights	Flow, Sediment, Erosions, Nutrients, Bacteria, other pollutants	
Other Stream Restoration Projects	1. Wreck Pond Brk trib at NJ Sand & Gravel, east of Rte 34 2. Wreck Pond Brk trib at St. Catherine’s Cemetery to	Flow, sediment, erosion	
Hannabrand Brk Regional Stormwater Basin	Upstream segment of Hannabrand Brook	Flow control, sediment, other pollutants	

### **6.2.2 Stream Restoration Headwaters of Wreck Pond Brook and Hannabrand Brook**

Final results from the FSCD’s stream assessment indicate severe sedimentation conditions where Wreck Pond Brook passes under the north-bound lanes of the Garden State Parkway. This condition may be addressed through inclusion in a facility stormwater management plan prepared by the New Jersey Highway Authority. Work in this area should involve the Highway Authority, including potential funding sources.

RCE identified W5 (Hannabrand Brook at Bailey's Corner Rd in Wall) as a site in need of restoration in their studies. Water quality results from storm sampling at W5 indicated elevated TSS during storms. In addition, field investigations observed sediment and discolored flow in upper Hannabrand Brook. Restoration efforts would reduce sediment loads and other pollutants in the Brook.

### **6.2.3 Online Sediment Basin at Black Creek**

This project was the installation of an on-line sediment basin at the discharge point of Black Creek to the North Branch of Wreck Pond just east of Route 71. However, it was determined that the purpose of the Basin could be served by improvements to the weir from the Spring Lake Golf Course, as discussed above. Thus, this project was removed from the BMP list.

### **6.2.4 Development of Natural Wetland at the Jimmy Burne Site**

Development of a natural wetland, sediment trap and water quality management basin on the so called "Jimmy Burne" property that would work in concert with restoration of the western part of Wreck Pond (see Section 6.2.1). This is also a possible location for disposal of dredged material from dredging of Wreck Pond. This recommendation, however, will only be analyzed further if Wreck Pond dredging becomes feasible. In addition, the Township of Wall currently has in place for use of the property as a passive park which may limit the feasibility of this option. No funds have been provided.

### **6.2.5 Wreck Pond Shoreline Habitat Improvements**

As discussed above, water fowl along Wreck Pond are a source of bacteria in the Pond. Shoreline vegetation can serve to discourage the use of the Pond by undesirable water fowl and encourage use by desirable bird species. However, this option would require cooperation by the local municipalities that may own the shoreline lands. Local residents may resist changes from grassed areas to other landscaping along the Pond shoreline. Further investigation into landscaping and other alternatives that may reduce water fowl use yet be aesthetically acceptable. No funds have been provided.

## **6.3 Other Potential Specific Stormwater Management Projects**

As the Plan has been developed, additional potential projects have been identified. Funding sources need to be identified for these projects.

### **6.3.1 Public Works Yards Restoration**

The Spring Lake Department of Public Works Yard is located along the banks of Black Creek, east of the NJ Transit railroad tracks. The majority of the sub-drainage area

drains into roadways, into a stormwater collection system and into Black Creek. The lower portion of the yard discharges via overland flow to Black Creek. In recent years, the Borough constructed an earthen berm to encourage collection and infiltration of stormwater runoff from this lower portion of the yard. However, the west side of the berm is flanked during moderate storm events, and allows stormwater runoff and transport of sediments to discharge to Black Creek.

Similarly, the Spring Lake Heights Public Works Yard is located on the western side of the NJ transit tracks, along the banks of Black Creek. The yard is fairly well contained however a storm sewer discharge pipe drains into a ditch running between the yard and the tracks and empties directly into Black Creek, a few feet upstream of the culvert under the tracks. Evidence of erosion within the ditch and sediment deposition at the ditch outlet is visible.

Wreck Pond RSWMPC members met with representatives from both municipalities in February 2008 to identify locations for the installation of structures to control and mitigate runoff, nutrients and bacteria from both maintenance yards. It is anticipated that a joint application will be made to NJDEP for project funding via an extant municipal Memorandum of Understanding. A project under consideration is the construction of a bio-retention basin at each yard. If found feasible, these basins would likely be proposed separately so that either basin may begin construction without encumbrance from the other. The basins would provide for filtering of surface runoff, infiltration and controlled discharge to the creek. It is anticipated that nutrient and sediment loads delivered to the creek from these sites may be significantly reduced. Considerations include space needed to construct basins of sufficient size and the grading required to direct runoff to the basins. Other options may also be considered to manage the stormwater. No funding has been provided.

### **6.3.2 Additional Stream Restoration**

In addition to the degraded streams found by FSCD during their assessments, Najarian Associates discovered two highly degraded stream reaches within the watershed. Restoration of these stream segments is proposed to improve flow conditions and reduce the potential for erosion which will reduce generation of sediment and of associated pollutants. The following paragraphs describe these stream segments.

- The stream reach flowing along the southern end of the New Jersey Sand and Gravel site, located on the western side of Route 34. There is a significant level of stream braiding and sedimentation within the stream, most likely from operations taking place on the site. This reach may be contributing to the degraded condition located just east of Route 34, as mentioned in the Wreck Pond Brook Headwaters Restoration Project discussed above.
- The stream reach flowing directly behind a large building located on the Saint Catherine's Cemetery property. The stream conveys stormwater runoff from an approximately 35 acre sub-drainage area in residential southern Wall Township.

The condition of the stream indicates that the stream as well as the stormwater runoff may be a contributor of sediments to the portion of Wreck Pond Brook located just west of the Route 71 and Wreck Pond culvert.

Restoration of these streams will reduce the potential for erosion and improve flow. Further investigation is needed to identify the causes of these issues, ownership, and feasible mitigation techniques. No funding has been provided.

### **6.3.3 Installation of a Regional Stormwater Basin on Hannabrand Brook**

Following review of the pollution budget and modeling efforts associated with this project, the numerous ponds located along the Wreck Pond Brook promote settling of sediments during storm events. No major impoundments exist along the Hannabrand Brook. Thus during storm events, the Hannabrand Brook produces more total suspended solids per acre than Wreck Pond Brook.

The installation of a regional stormwater management basin along the Hannabrand Brook would provide potential for settling sediments generated from the associated sub-watersheds. Possible issues associated with this are location of land to locate such a basin, environmental constraints including wetlands and riparian buffers, costs, and design considerations. The current hydraulic and hydrologic efforts could support the design of this project. No funding has been allocated.

## **6.4 Additional Studies and Proposed Work Groups**

The RSWMP and associated studies have provided significant data on watershed conditions and pollutant generation in the watershed. However, some areas of additional study have been identified. The following sections discuss additional sampling efforts and study groups under consideration.

### **6.4.1 Golf Course and Hannabrand Brook Storm Sampling**

The Spring Lake Golf Course has received substantial attention from stakeholders in the watershed due to local concern that the golf course may be a major contributor to the deteriorated condition of Black Creek. Due to its proximity and regular application of fertilizers, it had been suspected that the Golf Course has been a contributor of non-point source pollutants to local waters. This suspicion is made without consideration of the stormwater Best Management Practices used by the golf course such as covering of all materials to prevent contact by stormwater, equipment wash stations and a computerized irrigation system that is integrated with an automated weather station to ensure that appropriate amounts of irrigation are provided in concert with natural precipitation. The golf course also engages in Canada goose control through the use of a trained border collie.

Further, the NJDA hydrologic modeling study found that the Spring Lake golf course and its ponds provide substantial benefits to Black Creek through control of flood flows. The Golf Course also appears to act to trap sediment and associated pollutants that would otherwise be transmitted to Black Creek. Residential neighborhoods that drain directly to Black Creek are generally older and do not include stormwater management controls.

In order to provide direct investigation of the source of pollutants to Black Creek, the Committee determined that a sampling program designed to provide estimates of non-point source pollutants flowing into and out of the Golf Course property would provide valuable information. The preliminary sampling design consisted of two storm sampling events at stations upstream and downstream of the Golf Course. The existing NJDA and NA modeling studies would be used to project storm flows. Sampling during multiple events would be required to ultimately determine whether or not the Golf Course is of primary concern in the transmission of pollutants to Black Creek.

Likewise, a similar sampling plan was proposed for the Ridgewood Road Gravel Pit along the Hannabrand Brook. Specific sampling points up and downstream of the site would be monitored during multiple storm events to determine the actual loadings of specific pollutants, and to quantify flow volumes discharged from the site. Sampling parameters could be expanded to sample for possible volatile organics associated with the suspected mulch dyeing operations being conducted on-site. This would provide data to be used in design of any mitigation plan.

#### **6.4.2 Watershed Pond Studies**

The numerous ponds within the watershed play a significant role in not only watershed hydraulics, but the fate and transport of non-point source pollutants as well. During model development, it became obvious that there was a lack of information regarding the major ponds within the watershed. Specifically, information such as pond bathymetry, geometry, inflow/outflow characteristics, and ambient water quality condition were not available for the majority of ponds. Additional Information on these ponds would support the refinement of the hydraulic, hydrologic and pollution budget models developed under this Plan. Once these models are updated, they can be used to more accurately design restoration alternatives discussed in this section of the Plan.

Additionally, collection of pond information would aid in the development of dredge plans for waterbodies within the watershed. Because these ponds provide potential for settling sediments and aid in flood control, the maintenance of these ponds is vital in maintaining the ecological health of the watershed, as well as limiting the potential for flooding.

## **6.5 Recommendations for Black Creek**

Land use within the headwaters of Black Creek are characterized by medium to high density residential areas and two golf courses. Impoundments on both the Fairway Mews and Spring Lake golf courses act to moderate stormwater flows and trap sediments and pollutants prior to discharge to Black Creek from the lower impoundment of Spring Lake golf course located just to the upstream (west) side of the Rt. 71 culvert. The remaining areas which drain directly to Black Creek consist of high density residential neighborhoods bounding Black Creek to the north and south.

The Creek is impounded by a small weir structure located under the bridge at Ocean Road as it empties into Wreck Pond. The Creek is bisected by the New Jersey Transit rail road line and flows from the westerly portion of the Creek pass under the rail line via a small concrete culvert.

Due to the configuration of Black Creek as an open body of water rather than as a true “creek” or channelized water, sediments, nutrients and other materials are trapped and settle out, causing gradual filling. Water depth is very shallow (approximately 18” or less) and the area is frequently subject to algal blooms. The ponded area provides habitat to freshwater snails and various wading birds and waterfowl. The depth appears to be too shallow for most game fish to thrive. Also due to the shallow nature, the water body is unsuitable for typical aquatic recreation such as swimming or boating. Limited water quality sampling revealed DO super-saturation and low DO levels in this area. Elevated nutrients and the known algal blooms suggest eutrophic conditions.

During the course of Plan development, local residents appealed to the RSWMP Committee for suggestions to restore Black Creek. Among the many concerns expressed were upstream pollutant sources and sediment deposits and suggested actions included dredging and removal of the weir at Ocean Avenue to restore tidal fluctuation and “flushing” of the water body during periods of high tide. In response to these concerns, the Committee established the Black Creek Subcommittee consisting of local residents and TAC members. The Subcommittee was tasked with gathering and compiling extant reports and studies which could form the basis of a distinct management plan for the Creek. At the time of the writing of this report, the subcommittee is still in the process of compiling the information, data and suggested projects.

### **6.5.1 Proposed Black Creek Projects**

Several best management practices were jointly identified by the RSWMP Committee and Spring Lake Borough for immediate implementation in the Black Creek drainage area. These projects include the manufactures stormwater outfall project discussed in Section 6.1.1 and the rain gardens in Section 6.1.5. The Public Works Yards of both Spring Lake and Spring Lake Heights are located along Black Creek. Thus, the restoration measures under consideration in Section 6.3.1 will directly benefit the Creek.



### **6.5.2 Recommendations Further Action in Black Creek**

The Black Creek subwatershed has several factors that render it somewhat distinct from the other subwatersheds. In addition, there is strong local interest by residents to focus attention on this area as an environmental and recreational resource. Significant factors include:

- previous studies (according to residents) have already been conducted
- the proximity to and influence of Black Creek on Wreck Pond is different than that of waters in the watershed
- dense urbanization surrounding Black Creek and a lack of large open tracts of land for regional stormwater management require unique practices to improve water quality.

The Black Creek subwatershed may be ideally suited for grant funding for the purpose of scientific analysis of current conditions and the subsequent development of a separate management plan for the sub region. Among issues the residents and other interested parties raised as concerns are:

- Dredging of Black Creek and dredged material disposal
- Prevention of future sediment deposition
- Removal of the weir at Ocean Avenue to open Black Creek to tidal action
- Protection of wading bird habitat
- Restoration of primary contact recreation
- Restoration of fisheries
- Impacts to Wreck Pond water quality with weir removal
- Management plans for the upper watershed and the residential portions of the watershed to the north and south of Black Creek
- Establishment of a local committee to oversee the plan development and management
- impacts on flooding in and around Wreck Pond and its surrounding neighborhoods

Suggested solutions to some of the identified issues are competing or even mutually exclusive. Other issues are being addressed or considered in the overall RSWMP or in the Wreck Pond Management plan developed for the Borough of Spring Lake. Certain suggested actions likely will have unacceptable impacts on other ecosystems or on Black Creek itself and others may be infeasible. For example, the removal of the weir alone will not restore Black Creek to an open, “deep water” resource. Elevation differences between the bottom of Black Creek and Wreck Pond would most likely result in the development of a narrow channel (a true creek) flowing through the muck on the bottom of Black Creek with subsequent erosion and deposition of the sediments into Wreck Pond. The impacts of combining dredging with weir removal would also have to be studied. For example, the tidal excursion is controlled primarily by the invert elevation of the existing control structure on Wreck Pond and the Ocean Road weir. Dredging of Black Creek may not promote tidal exchange under regular tidal conditions.

In addition, impacts on tidal exchange within Wreck Pond would have to be investigated.

Further, deepening of Black creek in any form will result in the loss of shallow water wading bird habitat. Modification of the storage volume of Black Creek by dredging, weir removal etc. will affect flooding in Wreck Pond (it could be improved or worsened).

As noted above and in Book1, Sections 7 and 10, flow and water quality data for Black Creek are limited. Additional monitoring is suggested to provide better understanding of flow dynamics and current water quality conditions.

A detailed analysis of any or all of these issues and proposed projects is beyond the present scope of this management plan. The complexity of the area, socially and environmentally, may warrant a stand-alone management plan which can be developed as an outgrowth and compliment to the Wreck Pond Brook RSWMP. The overall benefit to the public in general should be assessed in a cost-benefit analysis with public input to rank and prioritize the management options of Black Creek. This issue will be addressed further during the implementation phase.

## **6.6 Wreck Pond Rehabilitation**

Implementation of watershed control and management measures will control future loadings to Wreck Pond. However, even with implementation of watershed management techniques, conditions in Wreck Pond require restoration to improve water quality. The following sections provide some options identified in the Spring Lake Borough Wreck Pond Environmental Study. That study is undergoing review by the Borough and further options may be identified.

### **6.6.1 Pond Dredging**

Dredging of the remainder of Wreck Pond was identified as a restoration method in NJDEP's four-point plan. Dredging would remove the layer of muck at the bottom of the Pond, increase the Pond depth and volume and possibly impact the release of bacteria and other pollutants from the Pond sediments. Currently, the Pond is very shallow. Continued sedimentation will cause further reductions in Pond depth and certain areas may eventually fill in. Pond dredging may also have impacts on the flushing of the Pond from the Ocean waters.

The NJDEP estimated that over 500,000 cubic yards of material would have to be removed from the Pond to dredge it to a depth of 6 feet. This would have short-term benefits to the water quality of the Pond. However, control of generation of sediment within the watershed would be critical to ensuring that the Pond would not have to be dredged again in the foreseeable future. Other proposed management measures in this Plan would ensure reduced future loading of sediment.

While dredging may have many benefits, notably the removal of the thick layer of muck in the Pond and increased water volume for dilution, dredging may also impact tidal exchange. Tidal exchange is likely controlled not by the depth of the Pond, but by the invert elevation of the outfall pipe. In many coastal dredging projects a benefit is improved flushing as the inlet is also dredged. In this case, the tidal prism may not increase as the outfall invert elevation will not change. Under that scenario, the tidal water transported to the Pond will meet increased inertia from the larger volume of Pond water already present. In addition, as the volume of permanent pond water increases, the tidal volume will make up a lower percentage of the permanent pool volume, possibly decreasing flushing. Thus, both the potential benefits and possible negative impacts of dredging must be considered.

The major difficulties associated with dredging are the cost and implementation. The cost is governed in large measure by the cost of disposing of the material. In addition, the material may have to be hauled to off-site disposal areas, in which case significant truck traffic would occur on local streets.

Design alternatives may minimize the need to remove material from the Pond, such as construction of an island within the Pond to serve as habitat and to allow the remaining areas to be deeper. Removal of sediment from some portions of the Pond, but not the entire Pond, may be beneficial and require the removal of less material. However, this would require careful design and implementation to ensure the remaining material is not simply redistributed after the partial dredging.

A request has been made to the US Army Corps of Engineers for funding. The ACE would require additional analysis of the cost and benefits of the dredging project. As of the writing of this report, no such funding is available.

### **6.6.2 Shoreline Stabilization and Vegetation**

Portions of the Wreck Pond shoreline are bulkheaded, portions contain riprap and portions are vegetated. Some areas of the Pond contain wooden bulkheads that appear to be dilapidated. Any areas of instability should be controlled to ensure sediment is not entering the water.

Currently, much of the shoreline is in grass. This provides access to the Pond for residents and is visually acceptable. However, the grass does not present a barrier to water fowl. As discussed in the section on water fowl management, re-vegetating this area could reduce the use of these areas by geese and make the area less attractive to these species. Local municipal officials and residents may raise aesthetics concerns about any re-vegetation proposals.

### **6.6.3 Measures to Reduce Beach Closings**

The pollution prevention and reduction measures and the Pond rehabilitation measures noted in the two previous sections will improve the water quality in Wreck Pond over

time. However, full implementation of these measures will be difficult and costly and are not likely to occur over the short-term. Even with significant reductions in pollutant loadings, there is likely to continue to be bacteria within the Pond.

If the bacteria sources cannot be completely eliminated, then the other option to reduce beach closings is to control the outflow from the Pond to the Ocean during storm events or control the movement of any outfall plume from the end of the pipe to the bathing beaches. Any solution has to consider numerous complicating factors including maintenance of the bathing beaches for the public, protection of the dune areas where endangered species nest, reduced or no impact on the potential for flooding, and maintenance of Pond water quality. Several alternatives were considered and presented to the Borough. The Wreck Pond Environmental Study identified design changes to the existing outfall structure that will retain stormwater from small to moderate storm events and allow slow discharge of these waters during the summer swimming season. The Pond would be open to tidal exchange during non-rainfall periods. Alternatives are under review by the Borough of Spring Lake. Any alternative would require additional environmental and engineering study.

#### **6.6.4 Modification of Beach Closing Model**

As discussed, beaches in Spring Lake and Sea Girt near the Wreck Pond outfall are currently required to close to swimmers whenever it rains more than 0.1 inches. However, the basis for this recommendation is from relatively old data. A recent study by the Monmouth County Health Department (MCHD) determined that high bacteria counts in the ocean waters offshore of the Wreck Pond outfall are not always directly related to rainfall in the watershed. In other parts of the US, the USGS and other agencies are developing more complex models to determine when beaches should be closed. Instead of focusing solely on rainfall, these models include consideration of tidal stage, wind direction, solar radiation and other factors. Also, there is some indication that water fowl and human use of the bathing waters and sand beaches may generate bacteria that can grow within the sand.

Agencies are focusing on development of predictive models that include factors in addition to rainfall. For example, the USGS has developed a “Nowcast” model for the Great Lakes. Although the model did not perform as well as hoped, the model did do better than simply using the previous day’s bacteria concentration.

The results of this study and the NJDEP summer 2008 sampling should be used in conjunction with Monmouth County Health Department information to develop a better decision process for Ocean swimming beach restrictions. New beach monitoring techniques and plans from other parts of the Country can be implemented as well.

#### **6.6.5 Addition of a Pumping System**

A recent consideration is the addition of a pumping system between Wreck Pond and the Atlantic Ocean. Such a system may allow for the rapid outflow of water to the

Ocean during flood events. In addition, if feasible, additional Ocean water could be added to the Pond to enhance tidal flushing. Local residents have reportedly noticed a distinct decline in the tidal flushing of the Pond since the outflow pipe was lengthened by NJDEP. This alternative would require further study as to feasibility, cost, and possible impacts to Pond ecology, flooding and other issues.

## **6.7 Education**

The RSWMP Committee has been meeting monthly over the past several years as the plan has been developed. The Committee includes County and State agency staff, municipal officials and staff, local environmental commission members, engineering and environmental consultants to the County and municipalities, and interested public. Watershed residents have been regular attendees at these meetings and provided valuable information on watershed conditions.

Public meetings are planned as part of the finalization of the RSWMP. Meetings have been held with Municipal officials and staff. Public meetings are proposed for the fall of 2008, following publication of the RSWMP.

As part of the Implementation Phase, additional public input will be essential. The Committee will continue to meet as needed. As discussed in the Implementation Strategy, following, a Wreck Pond Watershed Commission is proposed which will continue public education and involvement.